Substitute Specification with amendments shown.

~~DISCLOSURE OF INVENTION~~

TITLE: A Bio-reactive Grease and Oil Separator

This application pends from that Provisional Application No. 60/040,690 filed March 13, 1997

Field of The Invention

The invention herein relates to the separation and removal of oil and grease from wastewater.

Background of The Invention

~~PROBLEM SOLVED BY INVENTION~~

Food service establishments and industrial processing facilities generate grease, oil, sugars, starches and other contaminants in their wastewater. Grease and oil are major contributors to blockages and backups in drains and mains, unpleasant odors, costly pumping of interceptor tanks and in extreme cases, excavation of mains, drains and tanks.

Current treatment systems have shortcomings related to incomplete separation and retention. Current treatment systems concentrate mainly on separation and do not address the subsequent problem of disposal of the separated substances.

Summary of the Invention

The suggested invention addresses the complete problem presented by objection-

Certificate of facsimile filing on March 20, 2003 by Floyd E. Ivey.

Application No. 09/041,685

able substances through the application of fluid mechanics and bio-technology.

Brief Description of the Drawings

The foregoing and other features and advantages of the present invention will become more readily appreciated as the same become better understood by reference to the following detailed description of the preferred embodiment of the invention when taken in conjunction with the accompanying drawings, wherein:

Figure 1. is a depiction of a reactive grease separation assembly comprised of a media matrix (1). The media matrix comprised of at least one inner core (70) received into a tube (20). The media matrix (1) depicted is comprised of a plurality of tubes (20) each receiving at least one inner core (70). Each tube (20) is sized to receive an elongated media inner core (70. The inner core (70) having at least one vane (90), and as depicted having a plurality of vanes (90) and as depicted at least eight vanes (90). The at least one vane (90) extending from a central core element (95) where the central core element (95) coincides with the tube axis (25). The central core element (95) of at least one inner core (70) parallel with the central core element (95) of other at least one inner core (70).

The at least one inner core (70) has a top (75) and a bottom (80) and a length (85). The tube (20) having a tube top (25), tube bottom (30) and tube length (35) and tube (20) having a tube axis (37) centrally positioned from the tube top (25) to the tube

bottom (30) and extending throughout the tube length (35) of each tube (20). The tube (20) in the preferred embodiment being cylindrical but not thereby limited to other geometric cross-sections and shapes. The tube length (35) generally less than the inner core length (85). As will be appreciated by one of ordinary skill in the art, the tube (20) receiving at least one inner core (70) may be positioned at any location along the inner core length (85), i.e., such that the tube top (25) is proximal the inner core top (75), such that the tube bottom (30) is proximal the inner core bottom (85) or such that the tube (20) is positioned intermediate the inner core top (75) and inner core bottom (80).

The tube (20) having an inner wall (140) where at least one depression or groove (150) is formed in the inner wall (140) which receives at least one vane (90), of the at least one inner core (70) received into the tube (20), at a vane tip (98). The groove (150) comprising vane (90) restraining means securing the at least one inner core (70) in a fixed position within said tube (20). It will be appreciated by those of ordinary skill in the arts that the groove (150) may be a structure extending from the inner wall (140) forming a groove (150) which will receive at least one vane (90). Alternatively it is understood that the groove (150) may be a depression formed into the inner wall (140) capable of receiving the at least one vane (90). Vane (90) restraining means may be by a friction fit between the vane tip (98) when received into a groove (150) or by application of an adhesive or a mechanical fixing means between the vane tip (98) and the groove (150). In the preferred embodiment at least two depressions or grooves (150) are formed

Certificate of facsimile filing on March 20, 2003 by Floyd E. Ivey.

Application No. 09/041,685

in the inner wall (140) with each of said grooves (150) receiving at least one vane (90). The at lease one vane having a vane surface (92). The at least one vane (90) extending from the central core element (25) along the length of said central core element (25). The surface (92) covered with a biofilm (97). In the preferred embodiment at least eight vanes (90) are spaced equidistant from the adjoining vane (90) and extending from the central core element (25).

The tube (20) having an outer wall (190) having at least one fin (200) extending outwardly therefrom. As depicted the tube (20) has at least four fins (200) extending from said outer wall (190). However, one of ordinary skill in the arts will appreciate that fins of 1...n may be employed in accordance with the space available and surface area desired. The fin (200) is generally elongated having a fin surface (210) and, in the preferred embodiment, extends outwardly from the tube outer wall (190). Where a plurality of tubes (20) are utilized the plurality of tubes (20) contact adjacent tubes (20) at the respective tube outer walls (190) at at least one contact point (195) where, in the preferred embodiment, affixing means, including adhesives, mechanical fasteners and other methods or devices as are appreciated by those in the affixing arts, are utilized to fix adjacent tubes together and hence to fix the position of the plurality of tubes (20) within the media matrix (1). Tube at least one contact points (195) are, in the preferred embodiment, flattened surfaces extending from the tube top (25) to the tube bottom (30) parallel with the tube axis (37). In an alternative embodiment, tubes (20) in a media

matrix (1) may be alternatively or additionally fixed in position by affixing means employed at an intersection of fins (200) of adjoining tubes (20).

The tube inner wall (140) having an inner wall surface (142), the tube outer wall (190) having an outer wall surface (192). Inner wall surface (142), outer wall surface (192), vane surface (92) and fin surface (210) receive biofilm (97).

Figure 2 is a top plan view of a media matrix

Figure 3 is a section view of an inner core showing a plurality of vanes.

Figure 4 is a section view of a tube showing an inner wall, an outer wall, at least one groove and at least one fin.

Figure 5 is a detail showing the groove which receives at least one vane.

Figure 6 is a top view of a grease separator media matrix container (250). The top (290) is depicted. Wastewater inlet (350) and discharge pipes (400) are depicted.

Figure 7, 9 and 11 depict the grease separator media matrix container (250) in back view, section view and side view. Wastewater inlet and discharge pipes are depicted.

Certificate of facsimile filing on March 20, 2003 by Floyd E. Ivey.

Application No. 09/041,685

Figure 8 depicts the top.

Figure 10 is a detail from Figure 9 showing the discharge pipe (400).

DETAILED DESCRIPTION

~~DESCRIPTION OF THE INVENTION:~~

Figures 1 through 11 depict the preferred embodiment of the invention. The proposed invention consists of a superpermeable interactive membrane or media, depicted in Figures 1 through 5 ~~(see attached diagram)~~ which as a result of its unique geometric configuration, produces a predictable fluid flow conducive to the release of suspended materials and the transportation of the substances to a companion geometric configuration of tube inner wall surfaces (142), tube outer wall surfaces (192), of vane surfaces (92) and fin surfaces (210) which are designed to maximize surface area, regulate laminar flow within vertical surfaces to encourage the development of and maximize the production of a live biofilm (97) and to maintain a beneficial environment for bio-oxidation. The membrane/media/substrate/containment or media matrix (1) and grease separator media matrix container (250), is comprised, in the preferred embodiment, of a plurality of cylindrical tubes (20), each having a tube axis (37) centrally positioned from the tube top (25) to the tube bottom (30) and throughout the tube length

(35) of each tube (20). Each tube (20) is sized to receive an elongated media inner core (70). The media matrix (1) is comprised of at least one inner core (70) received into at least one tube (20). The at least one inner core (70) is, in the preferred embodiment, having an inner core length (85) greater than the tube length (35) of the at least one tube (20) into which it is received.

The media matrix (1) depicted is comprised of a plurality of tubes (20) each receiving at least one inner core (70). The inner core (70) having at least one vane (90), and as depicted having at least eight vanes (90). The at least one vane (90) extending from a central core element (95) where the central core element (95) coincides with the tube axis (25). The at least one vane (90) extending from the central core element (25) along the length of said central core element (25). The at least one vane (90) has a surface (92). The surface (92) covered with a biofilm (97). In the preferred embodiment at least eight vanes (90) are spaced equidistant from the adjoining vane (90) and extending from the central core element (25).

The tube (20) having an inner wall (140) where at least one depression or groove (150) is formed in the inner wall (140) which receives at least one vane (90) of the inner core (70) received into the tube (20). The groove (150) comprising means of restraining the at least one inner core (70) in a fixed position within said tube (20). It will be appreciated by those of ordinary skill in the arts that the groove (150) may be a structure extending from the inner wall (140) forming a groove (150) which will receive at least

one vane (90). Alternatively it is understood that the groove (150) may be a depression formed into the inner wall (140) capable of receiving the at least one vane. It will be appreciated that the tube (20), may be of a length less than the length of the at least one inner core (70) received by the at least one tube (20). One of ordinary skill will appreciate that the at least one tube (20) receiving an at least one inner core (70) may be positioned at the top, middle or bottom of the at least one inner core (70) and thereby fulfill the function of fixing the position of the at least one inner core (70). In the preferred embodiment at least two depressions or grooves (150) are formed in the inner wall (140) with each of said grooves (150) receiving at least one vane (90). The tube (20) having an outer wall (190) having at least one fin (200) extending therefrom. As depicted the tube (20) has at least four fins (200) extending from said outer wall (190). The fin (200) is generally elongated having a fin surface (210) and, in the preferred embodiment, extends outwardly from the tube outer wall (190) so as to contact at least one fin (200) from at least one additional tube (20). The fins (200) are interconnected by means thereby fixing the positions of a plurality tubes (20) and hence comprising the tubes (20) required in forming a media matrix (1). In the preferred embodiment, as seen in Figures 6 through 11, a grease separator media matrix container (250) is sized to receive the media matrix (1). Wastewater inlet (350), (375) and discharge pipes (400) are depicted. Vane surfaces (92) and fin surfaces (210) comprise surface area, regulate laminar flow within vertical surfaces to encourage the development of and maximize the production of a live

biofilm and to maintain a beneficial environment for bio-oxidation.

The media matrix (1) may be configured to a multitude of applications appropriate to each treatment task. The application depicted, as seen in Figures 1 through 11 ~~(see diagram)~~ is intended for greywater remediation. While the preferred application of the elements of the suggested invention are interactive, each element may be applied to fluid treatment independently.

Fluid flow parallel to the media surfaces produces continuous contact between the fluid and surface area of the media which, when covered with a biofilm, effects more efficient mass transfer of an organic or inorganic substrate within the biofilm thereby assisting retention, decomposition and/or biotransformation.

While a preferred embodiment of the present invention has been shown and described, it will be apparent to those skilled in the art that many changes and modifications may be made without departing from the invention in its broader aspects. The appended claims are therefore intended to cover all such changes and modifications as fall within the true spirit and scope of the invention.

In the Drawings

The Drawings are amended to eliminate portions of the dimensioning references

and comments. Reference numerals are added to correspond with the Detailed Description. Formal drawings will be provided upon the Examiner's allowance of any claim. Some written comments on the drawings may prompt a future amendment to the specification with the written comments then removed from the drawings.

Certificate of facsimile filing on March 20, 2003 by Floyd E. Ivey.

Application No. 09/041,685